Appropriate Management of the Nonvigorous Meconium-Stained Neonate: An Unanswered Question

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In this issue of Pediatrics, Chiruvolu et al1 compare outcomes in infants who are nonvigorous and meconium stained from before and after a recent recommendation was made not to routinely intubate and suction such infants. They found that not performing this procedure resulted in significantly more NICU respiratory admissions as well as an increased requirement for oxygen, mechanical ventilation, and surfactant therapy. Of infants diagnosed with meconium aspiration syndrome (MAS), infants who were not intubated had longer durations of oxygen and mechanical ventilation and longer lengths of stay. Was the recommended management change made too hastily?

The presence of meconium-stained amniotic fluid (MSAF) is associated with adverse outcomes.2 Approximately 10% to 15% of all newborns are born through MSAF, with 3% to 9% of them developing MAS and other respiratory disorders. Approximately 20% of infants born through MSAF are nonvigorous and are considerably more likely to have respiratory distress and adverse outcomes. Of term infants admitted to NICUs, 4% to 5% have MAS.3 In 1960, routine intubation and suctioning of neonates born through MSAF was first suggested.4 Three reports published in the mid-1970s revealed better outcomes among infants born through MSAF who had this intervention.5–7 Subsequently, the procedure was widely practiced. In a review of >175,000 infants born between 1973 and 1987, we found that the incidence of MAS had significantly declined since the publication of the aforementioned reports.8

Starting in the late 1980s, the value of intubation and suctioning among infants born through MSAF who were vigorous was questioned. To address this, we performed a large randomized controlled trial (RCT).9 Almost 2100 infants born through MSAF who were vigorous were randomly assigned to intervention or to expectant therapy. We did not find intratracheal suctioning to be of value, and resuscitation recommendations worldwide were changed. However, for the next 15 years, guidelines continued to advocate for the intervention among infants born through MSAF who were nonvigorous (the latter population had not been studied).10 During that period, 2 large RCTs were performed to address other therapies for MSAF: amnioinfusion and intrapartum oropharyngeal and nasopharyngeal suctioning.11,12 When neither of these were found to be of benefit, they were deleted from international guidelines.

In the most recent edition of the Neonatal Resuscitation Program, routine intubation and suctioning of infants who were nonvigorous was no longer recommended.13 The rationale was based on the evaluation of resuscitation science by the International Liaison Committee on Resuscitation (ILCOR).14,15 The conclusion of the latter was that there was insufficient evidence to support the intervention. Value was placed on

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COMMENTARY
harm avoidance (delay in positive pressure ventilation and potential harm of the procedure), as well as an unknown benefit of the intervention. Virtually all the evidence considered during the ILCOR’s deliberation was published before 2000. There was a small underpowered study published in 2015 that was considered by ILCOR to be of low-quality evidence. Subsequent to the Neonatal Resuscitation Program and the ILCOR disavowal of the intervention, a second small trial of even lower quality was published.

What is the evidence for harm done by routine intubation and suctioning in infants who are meconium stained? Possible adverse effects from a delay in positive pressure ventilation include lower 5-minute Apgar scores, the development of respiratory distress requiring oxygen or mechanical ventilation, and the requirement of inhaled nitric oxide or surfactant therapy. However, in none of the clinical trials of intubation and suctioning of infants born through MSAF do these clinical variables been worse in the intervention group. In fact, in the Chiruvolu et al1 article, infants who were not intubated were actually more likely to develop respiratory distress and require oxygen, mechanical ventilation, surfactant therapy, and inhaled nitric oxide. What is the evidence for physical injury to the airway by the intubation and suctioning procedure in infants born through MSAF? We found transient bradycardia in 26 of 1051 (2.5%) infants as well as other events lasting 15 to 60 seconds, including apnea (n = 2), laryngospasm (n = 6), cyanosis (n = 1), and vocal cord bleeding (n = 2).9 Hoarseness and stridor occurred in 14 infants, resolving within 2 minutes to 12 hours. Linder et al18 found that 2 of 308 (0.6%) infants who were intubated developed stridor and persistent hoarseness. Chettri et al’s16 group described 1 of 61 infants who had vocal cord bleeding. In the Chiruvolu et al1 investigation, several infants had bradycardia or cyanosis lasting a few seconds, but no other complications were noted (A. Chiruvolu, MD, personal communication, 2018).

Should the recent recommendation to not routinely intubate and suction infants born through MSAF who are depressed been made? Was there compelling evidence that the potential for harm outweighed the potential for benefit? In my estimation, no. Previous meconium-related recommendations were not changed until large well-done RCTs were performed and revealed no benefit. The same standard should be met for the intubation and suctioning of infants born through MSAF who are nonvigorous. The publications of the mid-1970s and the subsequent decline in MAS thereafter may have been a signal that some infants born through MSAF might benefit from intubation and suctioning. Unfortunately, after the recent recommendation not to perform the intervention in infants who are nonvigorous, no mechanism was set up to subsequently monitor outcomes. Because infants born through MSAF who are nonvigorous represent 1.5% to 3% of all births, it would have been nice to collect data that could reveal whether this had been an appropriate decision. As a firm believer in evidence-based clinical practice, I strongly believe that a large appropriately powered and designed RCT is needed to definitively answer the question concerning the optimal management of the infant who is nonvigorous and meconium stained. We owe it to our patients.

ABBREVIATIONS
ILCOR: International Liaison Committee on Resuscitation
MAS: meconium aspiration syndrome
MSAF: meconium-stained amniotic fluid
RCT: randomized controlled trial

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